

A significant range extension for *Pyrgus cacaliae* (Rambur, 1839) with the first record from the western Balkan Peninsula (Hesperiidae)

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Abstract. The European montane endemic *Pyrgus cacaliae* is reported for the first time from the Dinarid mountain chain in Bosnia and Herzegovina based on a previously misidentified museum specimen. The respective distributions and distinguishing characters of *P. cacaliae* and its closest relative, *Pyrgus andromedae* (Wallengren), are described. The significance of this record from biogeographical and conservation points of view is discussed. This discovery is a prime example of the advantages of systematic, long-term accumulation of scientific material and the resulting high value of properly managed scientific collections.

Introduction

Pyrgus cacaliae (Rambur, 1839) is a species endemic to Europe, with most of its range located in the Alps. Much smaller, peripheral isolates are found in the Pyrenees, the Carpathians of Romania, and the highest mountains of Bulgaria (Fig. 1). The closest relative of *P. cacaliae* is *Pyrgus andromedae* (Wallengren, 1853) which has a roughly similar range in southern and central Europe (Fig. 1): the Alps, the Pyrenees, the Romanian and Ukrainian Carpathians, the Dinarides of former Yugoslavia south to Šar Mt. in FYROM, and Pirin Mts. in Bulgaria (Jakšić 1988; Tolman 1997; Kolev 2002; Dincă et al. 2008). In addition, and unlike *P. cacaliae*, *P. andromedae* also occurs in the mountains of Fennoscandia as well as in Polar Ural.

In the Balkan Peninsula, *P. cacaliae* has so far only been known with certainty from the two highest mountains of Bulgaria: Rila (2925 m) and Pirin (2914 m). There are also old reports from Vitosha (2280 m) and central Stara Planina (2374 m) (Buresch & Tuleschkow 1930). However these reports have not been confirmed since, despite considerable activity in both massifs (Stoyan Beshkov, pers. comm. for central Stara Planina; pers. obs. on Vitosha almost yearly since 1998). Moreover, I have not found material of *P. cacaliae* from either mountain in public collections in Bulgaria. Thus the presence of this species in the said massifs, while entirely possible, is in need of confirmation (Kolev 2009). There are no published records of *P. cacaliae* between the Bulgarian populations and those in the Julian Alps of Slovenia, separated by nearly 900 km. It should however be noted that the old Slovenian records (Jakšić 1988) have not been confirmed in recent times and the species is currently excluded from the butterfly fauna of Slovenia (Verovnik 2007).

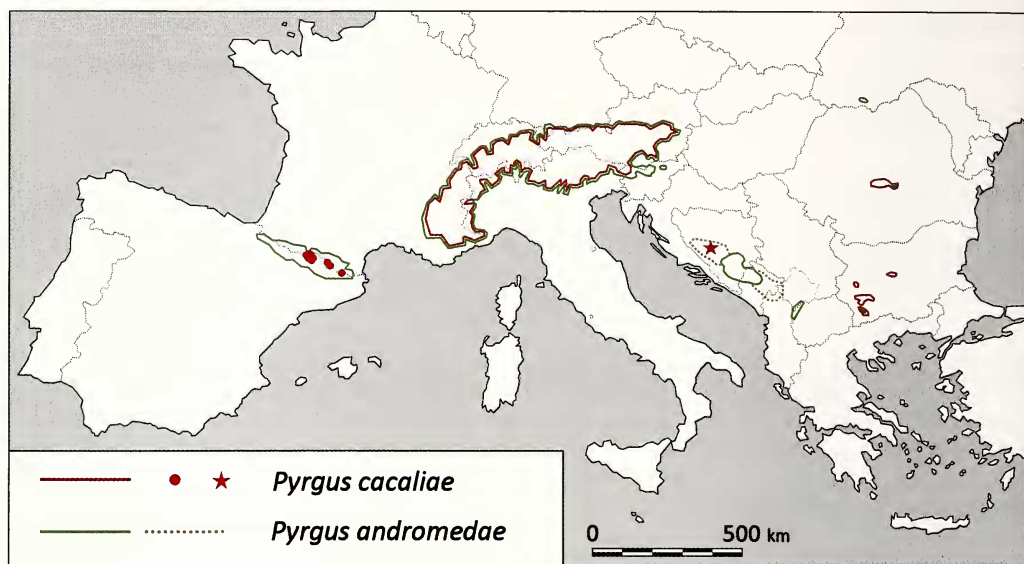


Fig. 1. Distribution of *Pyrgus cacaliae* (red) and *P. andromedae* (green) in South and Central Europe. Dots: single records of *P. cacaliae* in the Pyrenees, star: Makljen pass, Bosnia and Herzegovina. Solid line: recorded range, dotted line: possible range extent for *P. andromedae* in the Dinarides.

New record of *Pyrgus cacaliae*

In the course of cataloguing melanistic Lepidoptera in the collection of FMNH (Finnish Museum of Natural History, University of Helsinki, Finland), I came upon a female specimen from “Bosnia” which has been labelled as “*Pyrgus andromedae*” by Russian lepidopterologist Dr. Pavel Gorbunov. The specimen (Figs 2a, 2b), however, shows several morphological traits which distinguish it from *P. andromedae* (Figs 2d, 2e) and identify it without doubt as *P. cacaliae*:

- a single, faint whitish spot in space Cu2 of the forewing upperside, with minute traces of a second spot in space Cu1; in *P. andromedae*, there is typically a total of three large, clear white spots in these spaces (Fig. 2: 1);
- evenly diffused and poorly contrasting whitish suffusion on the upperside, particularly in the submarginal area of the hindwing, where this suffusion typically forms a conspicuous whitish band in *P. andromedae* (Fig. 2: 2);
- the absence of a whitish mark in the basal area of the hindwing discal cell underside; such a mark is present in *P. andromedae* (Dincă et al. 2008) (Fig. 2: 3).

Discussion

This specimen represents the first record of *Pyrgus cacaliae* from the western part of the Balkan Peninsula, and for Bosnia and Herzegovina. The label with locality data is shown in Fig. 2c. The pass of Makljen (sic), indicated as the place of capture of this specimen, is situated 65 km west of Sarajevo (43° 50,58' N, 17° 35,64' E, Fig. 1). As the label indicates, the specimen has been part of the collection of Otto Leonhard, a

coleopterologist from Blasewitz-Dresden. He visited Bosnia and Herzegovina during the Austrian occupation of the region where he collected Lepidoptera and Coleoptera (Rebel 1904: 133). Leonhard managed to amass a large collection of Lepidoptera from this region and became a well-known expert of Balkan Lepidoptera (Lelo 2000). Most of Leonhard's materials from the Balkan Peninsula were however not collected by himself, but by Moritz Hilf, an experienced collector who at the end of the XIXth Century travelled extensively in the western Balkans on behalf of the National Museum of Bosnia and Herzegovina. Beginning in 1900 Hilf began working for Leonhard, and in 1901 and 1902 he collected on the massifs of Raduša and Čvrsnica as well as the Makljen pass and the village of Prozor, 2 km SE of Makljen (Rebel 1904: 133). Rebel (1904: 136) stated that he examined Hilf's materials in the collection of Leonhard for his pioneering work "Studien über die Lepidopterenfauna der Balkanländer", including material from "Maklenpaß" (see below). Therefore, it is remarkable that *P. cacaliae*, a rather easy species to identify, is absent from Rebel's monograph. Since Rebel also did not list *P. andromedae* among the species collected in "Maklenpaß" or anywhere in the vicinity (Rebel 1904: 191), we may assume that Rebel has not mistaken the specimen for *P. andromedae*. This assumption is supported by the fact that this specimen was originally acquired by FMNH under an identity other than *P. andromedae*, and determined erroneously as the latter species by P. Gorbunov, as a separate label next to the specimen testifies, during a visit to FMNH in the mid-1990's. Therefore this specimen must have been misdetermined already in Leonhard's collection, but not as *P. andromedae*.

Indeed, Rebel's monograph provides evidence that this is the case. Rebel (1904: 191–192) lists, in genus "*Hesperia*", three *Pyrgus* species from Makljen: *Pyrgus serratulae* (Rambur, 1839), *Pyrgus alveus* (Hübner, [1803]) and *Pyrgus malvae* (Linnaeus, 1758). Of these *P. serratulae* is the only species for which Rebel gave exact data from Makljen: "Nur von Koinsko polje (12./7. [19]02 Stur[any].) und dem Maklenpaß (24.–30./6. [19]02 Hilf-Leonh[ard].) nachgewiesen, in einer Höhe von ca. 1100–1300 m erbeutet. Die Stücke vom Maklenpaß gehören zum Teile der kleineren, oberseits zeichnungsloseren (alpinen) var. *Caecus* Fr. an." (Rebel 1904: 191). The explicitly mentioned smaller size and reduced upperside markings of the "*serratulae*" from Makljen not only match the discussed *cacaliae* specimen, but are highly significant because they contradict the characters of Balkan *P. serratulae*. The latter, referred to the subspecies *P. serratulae balcanica* (Warren, 1926) and *P. serratulae major* (Staudinger, 1879), are characterized by an on average larger size and larger forewing upperside white markings than the *serratulae* group of subspecies (De Jong 1972). The ecological form *caecus*, in which these markings are strongly reduced, is most common in the Alps at altitudes of over 2000 m but has not been noted from anywhere in the Balkans despite the examination of abundant material (De Jong 1972: 4, 69–71). Moreover, neither the prominence of white markings nor the wingspan of Balkan *serratulae* vary in the direction of *f. caecus* even at the upper altitudinal limit of its occurrence (Bulgaria, Mt. Pirin, below Vihren peak, 1900–2000 m, Z. Kolev, pers. obs.). One of the most widely known characters of *P. serratulae* is that the basal white spot between the costal and subcostal veins on the hindwing underside is clearly rounded and entirely, or nearly so, encircled by the darker

background colour. However, the same character state may occur in *P. cacaliae*, as in the discussed specimen (Fig. 2: 4). It is thus easy to see how the latter could have been mistaken for a smaller form of *P. serratulae* with reduced upperside pattern. That Rebel might have mistaken the specimen as either of the two remaining *Pyrgus* species (*malvae* or *alveus*) reported by him from Makljen (Rebel 1904: 191–192) is highly unlikely due to their clearly distinct external morphology. Finally, the stated date of collecting of the *cacaliae* specimen, 27.6.1902 (Fig. 2: c), fits in the date range of the “*serratulae*” series from Makljen, “24.–30./6. ‘[19]02” (Rebel 1904: 191). There is therefore sufficient basis to conclude that the here reported specimen of *P. cacaliae* is one of a presently unknown number of specimens collected by Hilf for Leonhard and reported as “*Hesperia Serratulae*” “var. *Caecus* Fr.” by Rebel (1904: 191).

While there is no reason to doubt the provenance of this *P. cacaliae* specimen, its collecting locality is probably somewhat imprecisely stated. The pass of Makljen, while situated in mountainous terrain, lies at an altitude of only ca. 1120 m. This altitude appears low for *P. cacaliae*, which in Bulgaria has never been recorded below 1800 m and flies typically higher than 2100 m (Buresch & Tuleschkow 1930; Z. Kolev, pers. obs.). Likewise Tolman (1997) indicated a lower altitudinal limit of 1800 m for this species. Satellite imagery and geotagged photographs from Makljen (accessed in Google Earth®) show that the vegetation in and immediately around the pass is alternating dense woodland and meadows; such habitats are unsuitable for the mostly alpine *P. cacaliae*. Therefore, it appears more likely that the actual collecting locality of the *P. cacaliae* specimen is a higher mountain adjacent to Makljen. The fact that Hilf labeled his material from this locality as collected over a whole week is remarkable considering the very limited area of the pass, and in my opinion also indicates the possibility that he collected elsewhere besides Makljen during that time. There are several massifs within a 30-km radius of Makljen that qualify as potential localities for *P. cacaliae* by virtue of approaching or exceeding 2000 m in height. Closest to Makljen is Raduša (1956 m), which rises immediately to the west of the pass and where M. Hilf collected on 15.6.1902, just prior to collecting in Makljen (Rebel 1904: 148). Satellite imagery and geotagged photographs from Raduša (accessed in Google Earth®) show that the summit zone of the mountain above ca. 1700 m has extensive subalpine meadows and several small lakes. These habitats appear superficially suitable for *P. cacaliae* on account of the preference of this species for grassy areas around alpine lakes in Mt. Rila (Z. Kolev, pers. obs.). Another possible locality for *P. cacaliae* is Vranica (2110 m, 9 km NE of Makljen), a mountain with a true alpine zone where according to material listed by Rebel (1904: 185) Hilf collected between 14. and 22.7.1902. The absence of subsequent records from the vicinity of Makljen does not disprove the occurrence of *P. cacaliae*, since apparently nobody has collected there after Hilf (S. Lelo, pers. comm.). There is no reason to suppose that *P. cacaliae* might have become extinct in the area due to habitat degradation after the reported specimen was captured: this mountainous region is sparsely populated and human impact on the summit zones of the mountains, mostly by livestock grazing, is negligible (S. Lelo, pers. comm.).

This discovery suggests that *P. cacaliae* may eventually be discovered in other high mountains of the Dinarid chain. Larval host plant can hardly be a limiting factor for

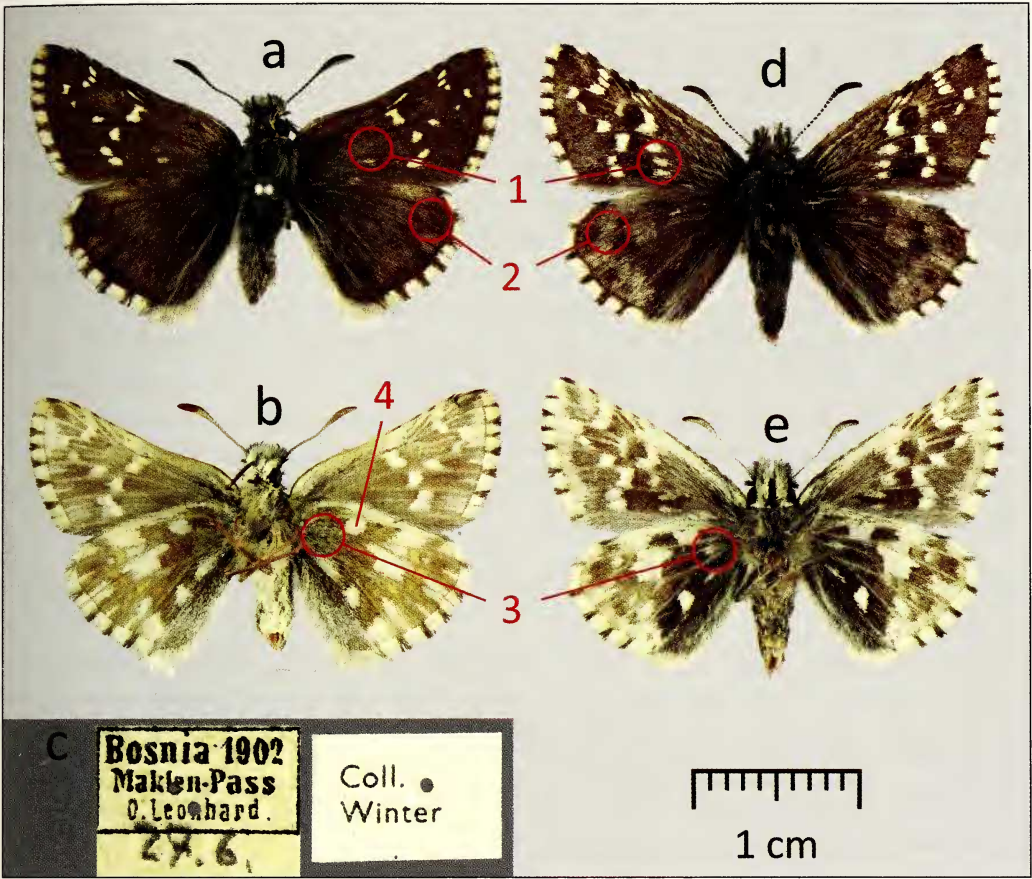


Fig. 2. *Pyrgus cacaliae* ♀ from Bosnia-Herzegovina (a: upperside, b: underside, c: labels (at twice the magnification of the rest of the figures) and *P. andromedae* ♂ (d: upperside, e: underside) from northern Finland, Kilpisjärvi, 4.07.1948, Lingonblad leg. in coll. FMNH. 1–3: diagnostic characters (see text); 4: rounded basal spot as in *Pyrgus serratulae*.

the occurrence of *P. cacaliae* there, as its larvae feed on *Potentilla aurea* L. (Rosaceae) and other montane species of this genus (Wagner 2003, 2006; Settele et al. 2008: 62). Several species of *Potentilla* are widespread in the high mountains of the Balkan Peninsula, including *P. aurea* in some massifs of the Dinarides (Andreev et al. 1992; Polunin 1997). The butterfly fauna of this region is known to be very diverse (Rebel 1904; Jakšić 1988), but as a whole it has remained sporadically studied due to the sheer size of the area and the difficulty of access to vast parts thereof, exacerbated by political and civil unrest in the 1990's. I hope that this discovery will stimulate further research on the butterfly fauna of the vast mountain system of the western Balkan Peninsula. It is also important to re-examine carefully the existing collection material of *Pyrgus* from this region. In this respect, it can also be expected that *P. andromedae*, which to this day has remained unrecorded from the vicinity of Makljen (Rebel 1904: 191; Jakšić 1988), may occur there and may in general be more widespread in the Dinarides than currently known (Fig. 1).

Conclusion

The here reported occurrence of *P. cacaliae* in the western Balkan Peninsula bridges the large gap between the Alpine and eastern-Balkan populations of the species. As such the present record represents a significant range extension for this European endemic. The provenance of the specimen on which the record is based is discussed and shown to be generally reliable, though the actual collecting locality remains to be clarified by future research. This record is of relevance to nature conservation as well because the smaller, widely isolated populations of *P. cacaliae* are considered to be vulnerable in the event of significant climate warming (Settele et al. 2008: 62).

This discovery is also a testimony to the benefits of a systematic, scientifically sound approach to collecting, and of large and well-managed collections of long standing such as FMNH. In the ongoing public debate about whether insect collecting should be consigned to the past, the present record provides one more example of the overwhelming advantage and importance of the traditional methods of gathering and preserving scientific data.

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